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PATENT SPECIFICATION

DRAWINGS ATTACHED

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Int. Cl.: —E 04 c 3/08//E 02 d, E 04 b

COMPLETE SPECIFICATION

Frame Structures

5 We, TRUSTEEL CORPORATION (UNIVERSAL) LIMITED, formerly of Lime Lodge, Heath Road, Oxhey, Watford, Hertfordshire, and now of Gate House The High, Harlow, Essex, a British Company, do hereby declare this invention, for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

10 The present invention relates to frame structures and has for an object to provide an improved structural member for use in forming frame structures.

15 According to the invention there is provided an elongated metal structural member for use in forming a building frame structure, the member having at least one pair of elongated elements secured in fixed parallel spaced apart relationship to form a longitudinal at least 20 substantially plane face of the member and to define between the elements a slot extending lengthwise of the member, the surfaces of the elements providing the sides of the slot being plane parallel surfaces.

25 Conveniently, the pair or pairs of elongated members are secured together by a connecting plate or plates inserted between the elements of the or each pair and secured thereto. The said elongated members are preferably of L-cross-section arranged so that, together with the said transverse connecting plates they can form an I section structural member.

30 The plates can extend lengthwise outwardly from one or both ends of the structural member so as to be received in a slot secured between of a like structural member. The members can be secured by means of a connecting element such as a jointing pin inserted 35 through the outwardly extending plate and through a transverse plate secured on the other structural member.

Structural members according to the inven-

tion are eminently suitable for constructing frame structures for buildings such as houses or bungalows for example and the structural members can be prefabricated as stanchions, floor joists, roof rafters, collar beams and the like which are accurately dimensioned and which can readily be assembled on site without the use of highly skilled labour.

By constructing a building frame with structural members according to the invention, the building of the house or other building is greatly facilitated because, once the frame is erected, the normal sequence of building operations can to a large extent be varied to expedite the completion of the house.

With conventional built houses, the first floor joists or beams cannot be installed until the brick layers reach first floor level and the roof tilers cannot commence their work until the walls of the house have been completed and the carpenters have pitched the roof. Thus the bricklayers, carpenters and tilers must work in sequence. Further delays are involved in that the first floor boards are not generally laid until the roof has been tiled. This in turn delays the plasterers who depend upon the first floor boards to support their trestles.

The frame structure provided by the use of structural members of the present invention provides a means whereby the traditional trades can operate simultaneously or in quick succession. The conventional internal wall of clinker block or brick that is spaced from the external wall by a cavity gap, can be replaced by woodwool slab, which is subsequently plastered, or by dry partitioning board or the like, secured directly to the metal frame of the building. This method of forming the internal skin of the main outer walls reduces the time required to erect the building and eliminates the mortar droppings that are formed when such inner skins are of clinker block or brick. Further, the carpenters can, at

member it will be appreciated that it need not be inverted and may, alternatively, be of any suitable form, for example of I-section.

Main Stanchions. The length of the main stanchions 3, that are to be secured to the pairs of back-to-back cleats 2, depends upon the height of the building to be erected. As shown, each stanchion 3 comprises a structural member according to the invention and is formed from four L-shaped members 11 spaced apart by main transverse brace connection plates 12 that are formed with apertures, and by subsidiary transverse and crossed brace connection plates 13 and 14. The plates 12, 13, 14 extend into and are secured between the L-shaped members 11, for example by rivetting or spot-welding, so that in conjunction with the L-shaped members they act as webs to provide a stanchion that is I-shaped in cross section, the two pairs of members 11 providing at least substantially plane longitudinal faces. The lowermost end of each stanchion terminates in a main transverse brace connection plate 12, having an aperture 5a that corresponds with the aperture 5 in the spaced apart cleats 2, and this plate 12 is lowered into the gap 4 between the stanchion engaging cleats 2 and is secured therein, for example by bolting. Other features of the main stanchions will be described as associated parts, to be secured thereto, and described hereinafter.

Cill Struts. Certain of the main transverse brace connections 12, Figure 4, serve as means for securing cill struts 15 in position, each cill strut 15 comprising a channel 16 closed at each end by an L-shaped bracket 17 welded or rivetted to the base of the channel 16. The upstanding arms of the brackets 17 are suitably apertured to match the apertures in the brace connections 12 and bolts or the like are passed through these apertures, when aligned, to secure the cill struts in position and so define the lower edges of the window openings.

Each cill strut 15 may have one or more pairs of cleats 18, Figure 5, secured to its underface, the cleats of each pair being arranged back-to-back so as to leave a gap 19 therebetween, these cleats having aligned apertures in their vertical faces. The purpose of the cleats 18 is to enable stud stanchions 20 to be secured in position between the underface of the cills 15 and the baseplate channel members 1. The stud stanchions 20 are formed from four L-shaped members 11 spaced apart by apertured main transverse brace connection plates 12, all as described with reference to the main stanchions 3. Since these stud stanchions are relatively short, however, no subsidiary transverse and crossed brace connections are necessary. The upper transverse plate 12 fits in the gap 19 between the cleats 18 and the lower transverse plate

12 fits in a gap 4 between cleats 2 on the channel members 1. Bolts or the like are then inserted in the aligned holes in the plates 12 and the cleats 2 and 18 to secure the stud stanchions in position.

Lintels. Where window and door openings occur, lintels are positioned over such openings. The lintel 21 shown in Figure 6 is an alternative form of structural member according to the invention and comprises an I-beam formed from four L-shaped members 11 with the web 22 thereof formed from metal plate. The lintel 21 could be made in a similar manner to the main stanchions 3 but the metal web 22, which may be of 10 S.W.G. sheet, is preferred in view of its greater load bearing capacity. The angle members 11 are preferably riveted to the web 22. At each end of the lintel 21 are two angle-members 23 (only one of which is shown), these angle members 23 being apertured such that they can be bolted to corresponding apertures in a pair of main transverse brace connections 12 in a main stanchion 3.

First Floor Beams. The first floor joists 24 (Figure 7) are constructed in a manner somewhat similar to the main stanchions 3 in that they are formed from four angle members 11 with the web thereof formed from main transverse brace connection plates 25 formed with apertures, and by subsidiary transverse and crossed brace connection plates 26, 27. Projecting longitudinally from each end of each floor joist 24 is a plate 28 that extends into the gap 29 between the angle members 11, this plate 28 being rivetted in position to the floor joist 24 as are the members 25, 26 and 27. Each plate 28 has one large aperture 30 and a number of smaller apertures 31. The aperture 30 is on the central axis of the floor joist.

For the purpose of securing the floor joists 24 in position, each stanchion 3 is provided with floor joist supporting plates 32, one on each side of the stanchion, these plates 32 being riveted to two brace plates 12 spaced longitudinally of the stanchion 3. The plates 32 are formed with holes or apertures 30, 31, corresponding in size and position to the holes or apertures 30, 31 in the plate 28. The plate 28 is inserted into the stanchion 3 between the plates 32 and one or more temporary joint locating pins 33 are then driven into the aligned holes 31. Thereafter a permanent jointing and load bearing pin 34 is driven into the aligned apertures 30.

The jointing pins 34 may each be in the form of a bush member slotted longitudinally along one side, the slot being, for example, 0.25 inches in width. The bush member is tapered at one end to facilitate its entry into the apertures 30. In order that bush member shall be capable of providing an adequate support for the floor joists, and all normal

stanchion remote from the box beam trimmer is provided with an unattached plate 65. The plate 65 and the end wall 62 of the box beam trimmer have apertures corresponding to apertures 66 in the plate 46 and the bracing member 53 so that these component parts may be secured together by pins, bolts, rivets, or the like. The plate 65 and the end face 64 of the wall 62 both have a single large aperture 67 through which a jointing pin 34 is driven to secure an eaves tie 47 in position, the stanchion connecting plate 50 of the eaves tie extending into the gap between the end face 64 of the end wall 62 and the plate 65 so as to be secured in position therebetween by the jointing pin 34.

The length of any particular box trimmer depends, of course, upon the length of the opening to be trimmed and, consequently, these box trimmers have, in general, to support one or more main rafters 40. For this purpose each box trimmer may be provided at spaced points along its length with one or more rafter supporting plates 46a similar to the plates 46 on the main stanchions 3. The plates 46a are secured in position by angle members 68 riveted to the side walls 60, 61. Between the angle members 68 and spaced downwardly from the plate 46a, a bracing plate 69, is riveted to the angle members 68 as is the plate 46a. A pair of apertured eaves tie supporting plates 52 are riveted to the plates 46a, 69, one on each side thereof. The front wall 60 of the trimmer box has a vertical slot 70 at each point at which the plates 46a, 69 are located, so that the apertured plate 50 of an eaves tie can be inserted into the box through each vertical slot 70 and into the space between the eaves tie supporting plates 52. A jointing pin 34 is then driven through the plates 52 and the plate 50 of the eaves tie. A roof rafter 40 is secured to the plate 46a as has been described with reference to the plate 46 and the rafter 40 in Figure 10.

At points intermediate the rafter supporting plates 46a, and intermediate a rafter supporting plate 46a and an end face 64, the box beam trimmer may be strengthened by a construction similar to that formed by parts 46a, 68, 69, except that the plate 46a is cut away obliquely from the rear wall 61 down to the front wall 60 of the box beam trimmer.

Collar beams. The collar beams 71, Figures 12 and 14, for the roof, are of I section and are formed from four angle members 11 spaced apart by transverse members 72, 73 and crossed members 74, these members 72, 73, 74, acting as the web of the beam and serving to space adjacent angle members apart so as to form a gap 75 between them. Each collar beam 71 has a rafter-connection plate at each end, one of which is shown at 76, this plate extending into the gap 75 between the

angle members 11 and being secured thereto, for example, by rivets. The plate 76 is insertable into the gap 41 between the angle members 11 of the rafters 40. For this purpose the upper angle members 11 of the collar beam 71 are shorter than the lower angle members so that the upper edge of the rafter-connection plate 76 is free to project into the gap 41. Collar beam supporting plates 77 are secured to the rafter, one on each side of the rafter, these plates 77 being riveted to two spaced apart transverse plates 43 of the rafter 40. The plates 76 and 77 each have small aperture 78 through which a temporary joint locating pin 33 can be passed, and a large aperture 79 through which a jointing pin 34 can be driven.

At the centre of each collar beam is a transverse plate 73 (Fig. 14) that extends upwardly beyond the upper angle members 11, this plate having an aperture 80. The lowermost hook 81 of an adjustable tie rod 82 passes through the aperture 80, the upper hook 83 of the adjustable tie rod passing through a hole 84 in a tie rod connection plate 85, to be described hereinafter with reference to Figure 13.

The collar beams 71 may be braced against each other by horizontal struts 86, these struts 86 being, for example, angle members with brackets 87 secured to their ends by rivets. The brackets 87 and the plate 73 have alignable apertures whereby the brackets 87 can be secured to the plate 73 by nuts and bolts.

Ridge strut and tie rod connection plates. The upper ends of the rafters 40 are connected to the tie rod connection plate 85, Figure 13. For this purpose each rafter 40 terminates at its upper end in an end plate 88 projecting into the gap 41 between the angle members 11 of the rafter. The plate 88 is riveted to the angle members 11 and has at its free end brackets 89 that are apertured such that they may be secured by bolts to the tie rod connection plate 85. It will be noted that the upper angle members 11 of the rafter extend beyond the lower angle members 11 to facilitate a neat assembly of the apex of the rafters. The ridge struts 90 may be angle members with plates 91 riveted to them at each end, these plates 91 being apertured such that they can be secured to the tie rod connection plate 85 by the same bolts as are used to connect the brackets 89 to the plate 85. As previously stated, the plate 85 has an aperture 84 for supporting the adjustable tie rod 82.

The ridge struts 90 may be of I-section, instead of the angle member shown, and may be constructed from four angle members and web members in a manner similar to the stanchions.

Timber fillet on rafters. To enable roof battens to be readily secured to the rafters

12. An elongated structural member substantially as herein described with reference to the accompanying drawings.
- 5 13. A frame structure for a building such as a house or bungalow comprising a plurality of structural members as claimed in any preceding claim.
- 10 14. A structural member as claimed in any preceding claim in which each elongated element is L-shaped in cross-section.
- 15 15. A frame structure according to claim 13 wherein the structural members provide stanchions, floor joists roof-rafters and collar beams.
16. A frame structure for buildings substantially as hereinbefore described with reference to the accompanying drawings.

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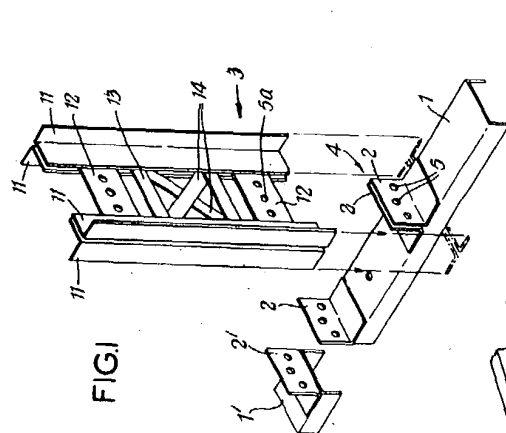


FIG. 1

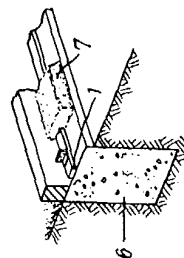


FIG. 2

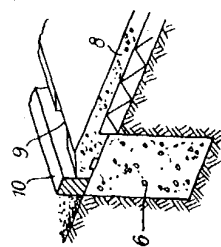


FIG. 3

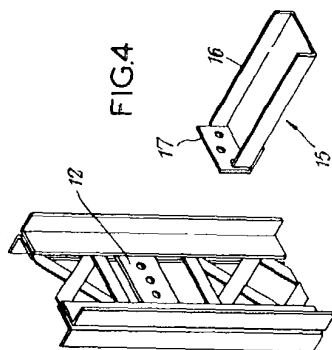


FIG. 4

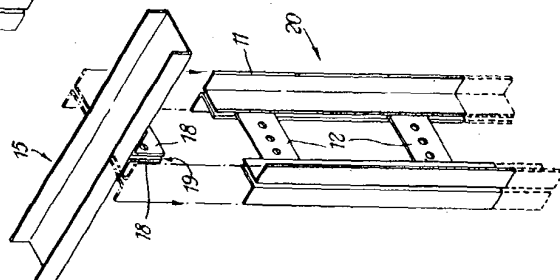


FIG. 5

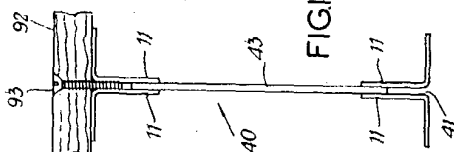


FIG. 5

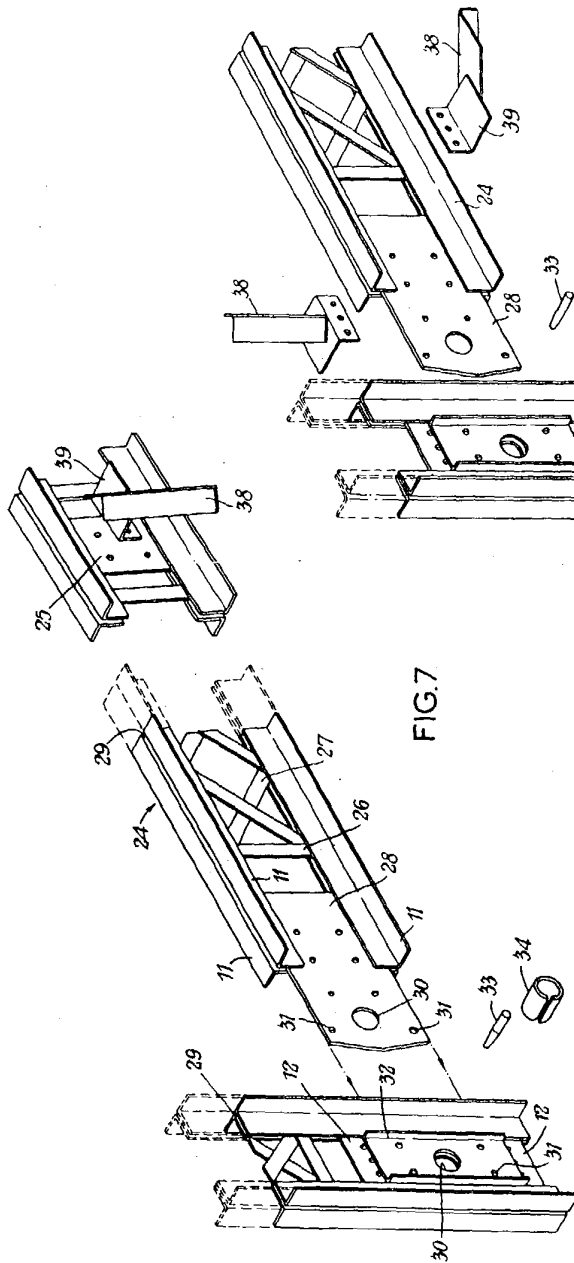
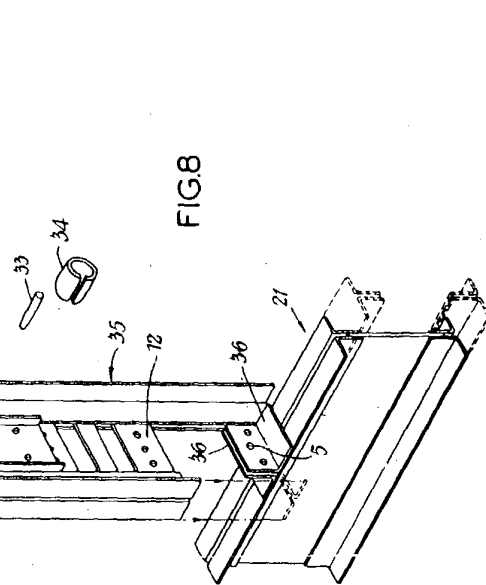


FIG. 8



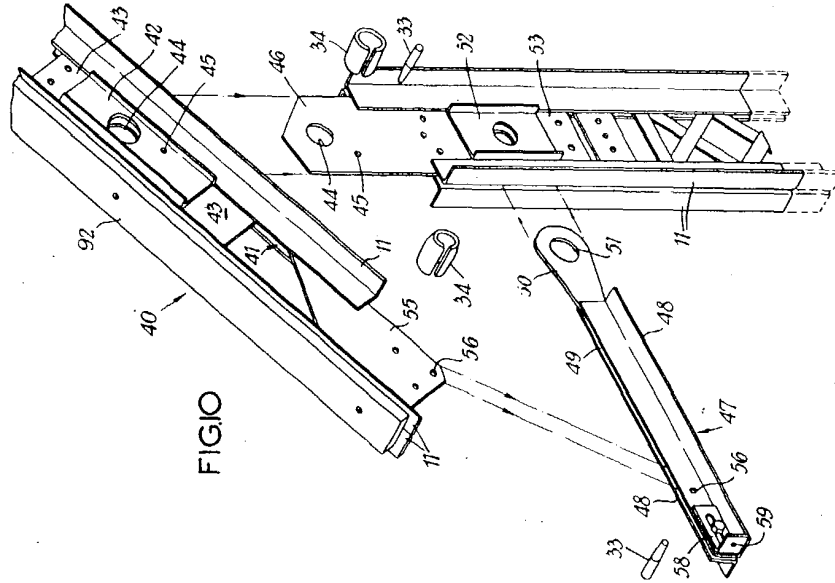


FIG. 5

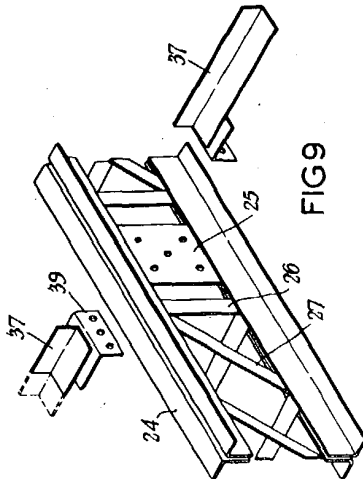


FIG. 9

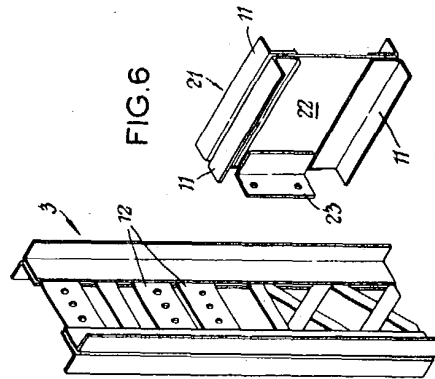


FIG. 6

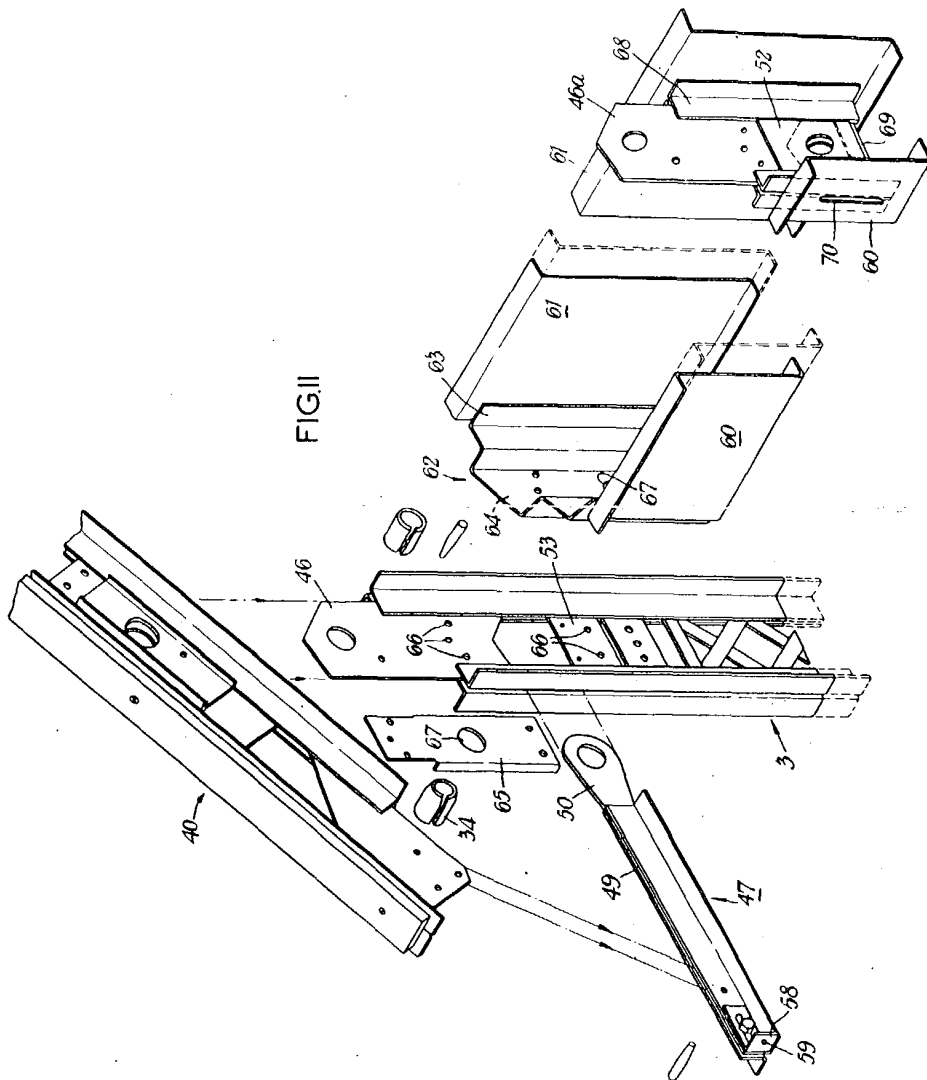


FIG. II

50
93.2

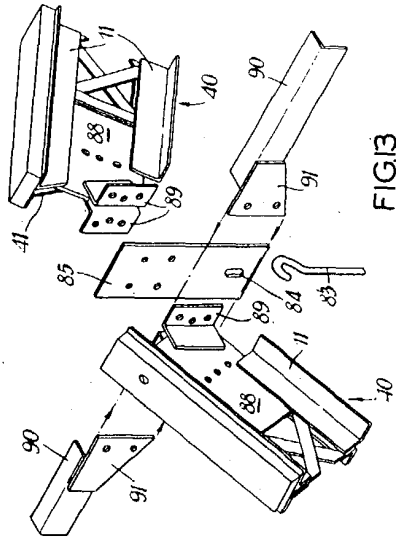


FIG. 13

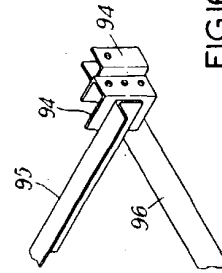


FIG. 16

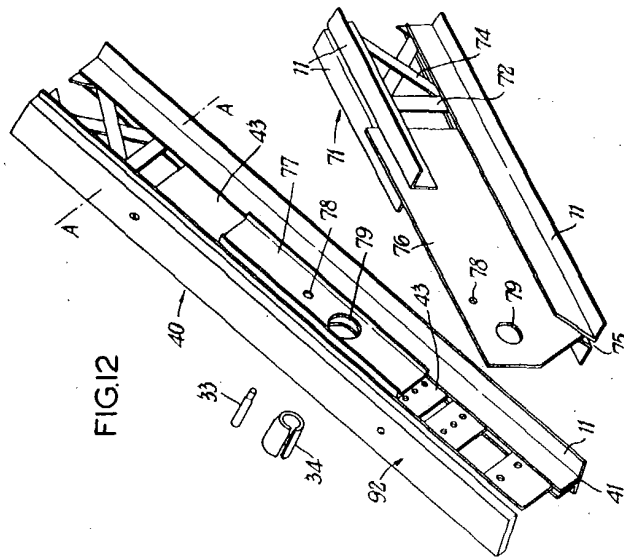


FIG. 12

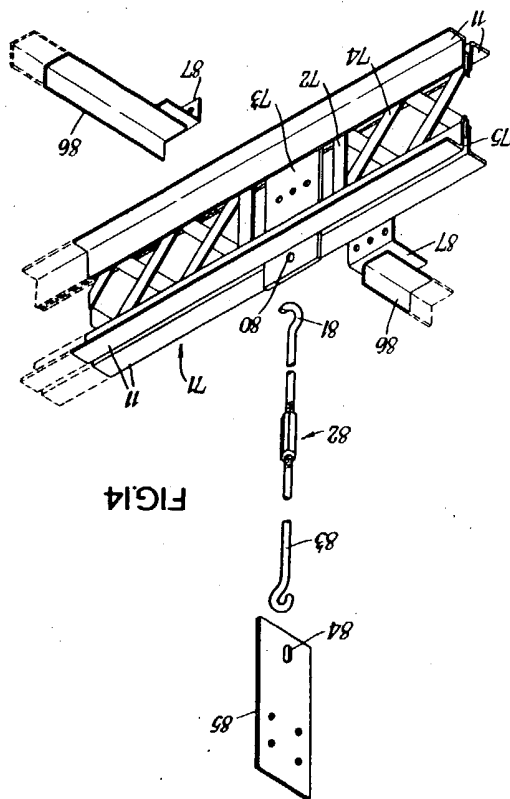


FIG. 14